## A.D. 1854 . . . . . . . . . N° 2027.

# SPECIFICATION

OF

## JAMES ROBINSON.

## FURNACES, FIRE BARS, &c.

LONDON:
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1855.

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## Furnaces, Fire Bars, &c.

**LETTERS PATENT** to James Robinson, of Huddersfield, in the County of York, Manufacturing Chymist, for the Invention of "Improvements in Apparatus for Generating Steam and Gas, and Consuming Smoke."

Sealed the 24th November 1854, and dated the 20th September 1854.

**PROVISIONAL SPECIFICATION** left by the said James Robinson at the Office of the Commissioners of Patents, with his Petition, on the 20th September 1854.

I, James Robinson, of Huddersfield, in the County of York, Manufacturing Chymist, do hereby declare the nature of the said Invention for "Improvements in Apparatus for Generating Steam and Gas, and Consuming Smoke," to be as follows:—

Firstly, the improvements consist in having a series of sets or tiers of gratings or fire-places, one above the other, so constructed that the uppermost shall have wider openings than the next, which shall also in like manner have wider openings than the succeeding set of gratings, so that the fire passing through the first shall fall on the second, and through the second to the third, and so on.

Secondly, in having the grate bars hollow, and when employed for generating steam, having an open communication at each end with a steam boiler, so that the water can circulate through them; but when used for generating gas, in having the grate bars provided with covers at the ends, so as to form a series of gas retorts, having pipes to carry off the gas, or by having such grate bars or retorts connected together at one or both ends, so that one pipe may serve to convey the gas away.

Thirdly, in causing the smoke to descend through the whole series or tiers of gratings to the flue or flues which are below, instead of being above the fire, as at present, the coal being supplied to the first or upper grates, as also the air necessary to combustion, and the draught or current downwards, through the gratings.

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said James Robinson in the Great Seal Patent Office on the 19th March 1855.

**TO ALL TO WHOM THESE PRESENTS SHALL COME,** I, James Robinson, of Huddersfield, in the County of York, Manufacturing Chymist, send greeting.

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Royal Letters Patent, bearing date the Twentieth day of September, in the year of our Lord One thousand eight hundred and fifty-four, in the eighteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said James Robinson, Her special licence that I, the said James Robinson, my executors, administrators, and assigns, or such others as I, the said James Robinson, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN APPARATUS FOR GENERATING STEAM AND GAS, AND CONSUMING SMOKE," upon the condition (amongst others) that I, the said James Robinson, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Royal Letters Patent.

**NOW KNOW YE,** that I, the said James Robinson, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement (that is to say):—

My Invention consists of forming or constructing a compact framework or apparatus, consisting of one, two, three, or more tiers of fire-places, all the bars of the said tiers being fitted and fastened to the front and back part of the said framework, the whole of which are hollow, made of boiler plates or similar material, forming one complete cellular apparatus. The coal or other fuel is supplied to the top or upper tier, and the bars or tubes are so arranged that the spaces between them are wider than in the next tier, and these are also wider than the spaces in the tier below; so that the fire passing through the top or first set of gratings will fall on and remain for a time on the second set, and then fall through to the third, and so on. The air necessary for combustion is also supplied at the top or upper part of the apparatus above the fire, instead of under it, as heretofore, by which contrivance I obtain a downward draught or current through the whole series of gratings, which causes the smoke from the top or green fuel to pass through its own and also through the red fires of the succeeding tiers of gratings, whereby it will be consumed. The whole of the said apparatus being hollow, and when used for generating steam is attached to the boiler or vessel by one or more connecting tubes in such a manner as to allow the water to circulate freely both through boiler and apparatus, it is evident that the water in the said apparatus will be heated and generate steam, as well as that in the boiler; in fact, the hollow heating apparatus may be considered part of the boiler itself. It will be easily perceived that by this arrangement a very great heating or steam generating surface is obtained, and by causing the smoke to descend through its own fire, and also through the bright fires which have previously fallen on the lower grates, it will be completely consumed, by which means a considerable saving of fuel will be effected, and the smoke nuisance abated. When the said apparatus is used for making or producing gas, I fix a cover or covers at one or both ends of the bars or tubes, and thus form a series of gas retorts with pipes or suitable apparatus to carry off the gas.

These my said improvements will be clearly understood by reference to the accompanying two Sheets of Drawings, in which the same letters of reference are used to represent the same parts in all the Figures.

Fig. 1, Sheet 1, is a longitudinal vertical section of my apparatus attached to an ordinary two-flued boiler, taken through the lines F, G, as seen in Figs. 3, 4, and 5; Fig. 2 is a side elevation of the same, with part of the brick-work removed, so as to shew the action of the heat; Fig. 3 is a horizontal section, taken through the line A, B; Fig. 4 is a cross vertical section, taken through the line C, D; and Fig. 5 is a front elevation. The whole of the apparatus when used for generating steam is constructed of boiler plates or similar material, with an inner casing. *a* represents the outside; *b*, the inner casing, by which a water space is formed around the fire box or fire-places; *d*, the bars or tubes, of which in this illustration there are three sets or tiers, connected to and opening at each end into the water space *c*; on the uppermost of these tiers the coals or other fuel is placed, as on ordinary grate bars, the spaces between them allowing the partially consumed fuel to pass or fall through to the next tier, where the spaces are smaller than those in the upper tier, thus causing the fuel to be retained for a time, until it becomes further consumed, and then falls to the next tier, and so on. *f* represents small tubes perforated at their sides towards the fires to admit air, as well as over the fire doors. The pipes *g* connect the apparatus with the boiler, by which there is a free circulation of both water and steam. H is a valve or damper, to be opened when the fire is "raked" for the night, or when steam is not required to be generated rapidly.

Sheet 2 of the accompanying Drawings shews the application of my improved apparatus for generating gas, in which Fig. 1 is a cross vertical section, and Fig. 2 a front elevation of the same. The tubes *a*, which are both grate bars and gas retorts, may be made of iron, fire clay, or other suitable metal or material, and of any convenient size or form, as well as the sides and top *b*. *c* represents perforated tubes, open at the outer end to the atmosphere, for supplying air to the lower fires; *d*, a partition to divide the current of air; *e*, the flues; *f*, the fire doors; *g*, the ash door; *h*, a cover for the retorts; *i*, bars or braces to secure the covers by the pins and cotters, as shewn at each end; *k*, the escape or discharge pipe connected to the mouth-piece, which has a communication with all the retorts. Figs. 3, 6, and 7, of No. 2 Sheet of Drawings, shew another mode of constructing the hollow bars and framework, by making them of a form or shape differing from the circular form, by which it will be seen I gain an additional amount of heating surface, and still retain the additional number of fires, with the downward draught or current; but although I have shewn several fires in all these views, they are not necessary for the purpose of securing the downward draught, as the principle may be applied to one fire or furnace of the ordinary construction.

Having thus described the nature of my said Invention, and in what manner the same is to be performed, I desire it to be distinctly understood that I do not confine myself to the exact details herein set forth, as such may be varied or modified without departing from the principle thereof. I am aware that hollow bars have been proposed to be adopted in other furnaces; I do not, therefore, claim such bars as of my Invention, or the exclusive use thereof, except when combined as above described; but I hereby declare that

I claim as my Invention an apparatus for generating steam and gas, constructed and arranged so that the smoke or combustible matter will descend through and from its own fire and fire bars, or through its own fire and fire bars and other fires in succession, thus establishing a downward current or draught.

In witness whereof, I, the said James Robinson, have hereunto set my hand and seal, this Fifteenth day of March, One thousand eight hundred and fifty-five.

JAMES ROBINSON. (L.S.)

Signed, sealed, and delivered by the within-named
James Robinson, in the presence of

W^M TASKER,
Patent Agent,
Halifax.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1855.